EDDMapS

Early Detection & Distribution Mapping System

Invasive Plant Mapping Handbook

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Center for Invasive Species and Ecosystem Health
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Front Cover:

GPS device mapping Chinese tallowtree. Photo Credit: David J. Moorhead, University of Georgia, Bugwood.org

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All images can be found in the Bugwood Image Database System at images.bugwood.org.

EDDMapS

EDDMapS, the Early Detection & Distribution Mapping System, is an innovative web-based mapping tool which can be used to document the distribution of invasive species across the United States and help identify leading edges of new infestations. Volunteers learn how to collect data on invasive species and enter the data into EDDMapS through a web-based data entry form. The intent of this handbook is to empower the public to become actively involved in effectively slowing the spread of harmful invasive species and to reduce their environmental and economic damage.

EDDMapS was designed as a tool for State Invasive Species Councils, Exotic Pest Plant Councils (EPPC), Cooperative Weed Management Areas (CWMA) and Cooperative Invasive Species Management Areas (CISMA) to develop more complete local, state and regional level distribution data of invasive species. Identification of "leading edge" ranges of new invasive threats allows implementation of EDRR (Early Detection & Rapid Response) programs. Invasive plant lists and management priorities can be updated regularly as new data are recorded. Your participation in this initiative will contribute not only to state mapping efforts but also to national efforts to map the distribution and spread of invasive species.

If you are new to plant identification, take heart. It should be easy to familiarize yourself with the invasive plants in your area. Many volunteer groups have a "Top Ten Most Wanted" or a "Dirty Dozen" list of invasive plants on which they focus data collection and reporting. Check with the Exotic Pest Plant Council or Invasive Species Council in your area for trainings on plant identification. Information on invasive plants is available at the Invasive Plant Atlas of the United States. It can be found at www.invasiveplantatlas.org.

S. Dewey, USU

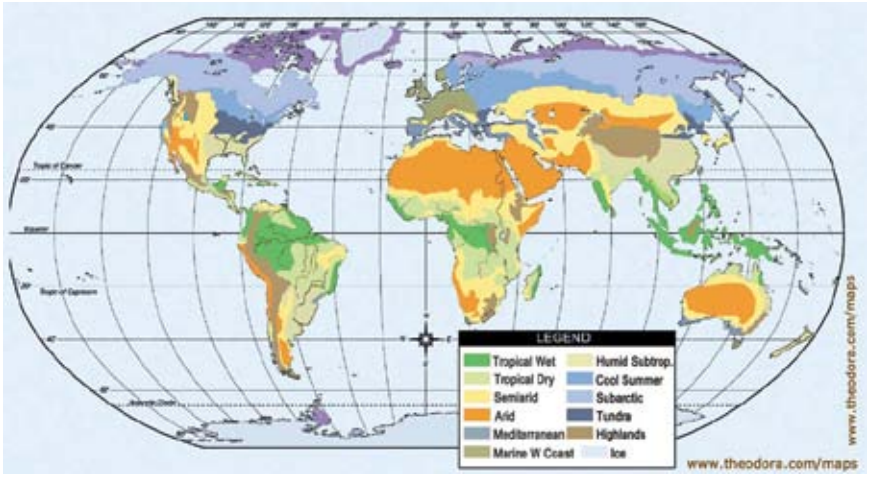
N. Loewenstein, AU

What is an Invasive Species? Any species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These non-native species aggressively compete with and displace the associated flora and fauna communities.

K. Rawlins, UGA

This definition is based on the definition of invasive species as written in Executive Order 13112 and clarified in "Invasive Species Definition Clarification and Guidance White Paper", submitted by the Definitions Subcommittee of the Invasive Species Advisory Committee (ISAC) and approved by ISAC April 27, 2006.

Where Do They Come From? Species which have become invasive often come from areas which have climates similar to our own. Many invasive species which are a problem in the United States originated in South America, Asia, Europe, Australia and Africa.



How Did They Get Here? Some species were introduced accidently in packing material, as crop contaminants, in shipping containers or from the cargo holds of ships. But many invasive plants have been brought here deliberately. Only a small portion of non-native species are invasive. We rely on non-native plants for food, for their beauty as ornamentals in our gardens, for their usefulness in feeding wildlife, and enhancing our environment.

Why Do Plants Become Invasive? Just to be clear, not all exotics are invasive. Exotic or non-native species are considered to be invasive only when they cause harm. Of our agricultural crops 98% are not native to the regions where they are grown. Predicting which plants will become invasive is difficult. Scientists are still trying to discover why a plant can suddenly become an invasive problem after many years. The two lists here show that many of the characteristics we prize in an ornamental plant are very similar to the characteristics which increase the likelihood of a non-native plant becoming an invasive problem.

Invasive

- Habitat generalist
- Out-competes other plants
- Reproduces easily
- Abundant seeds
- Bird-dispersed seeds
- Not affected by native pests/diseases

Ornamental

- Hardy-easy to grow
- Requires little attention, "care free"
- Easy to propagate
- Abundant flowers
- Fruits to attract birds
- Disease and pest resistant

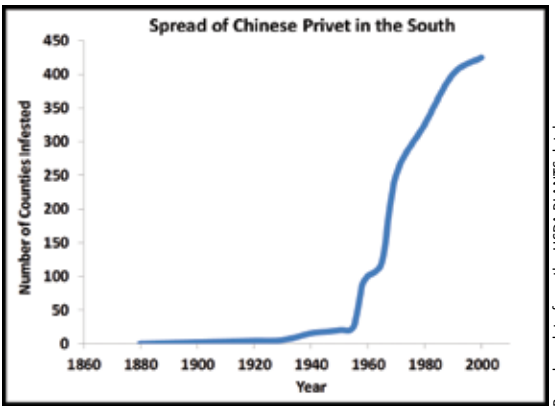
K. Rawlins, UGA

Many invasive plants were initially introduced for landscaping

If a non-native plant is used over a long period of time, it stands a better chance of naturalizing. Extensive use in landscaping also increases the likelihood that a plant will naturalize, which is the first step to becoming an invasive problem. Many invasives start on disturbed soils and habitat disturbances such as construction, grading, plowing and mowing which can increase the vulnerability of any habitat to invasive species. Areas such as rights-of-way, fencerows, old fields, ditches and roadsides all have a high rate of disturbance.

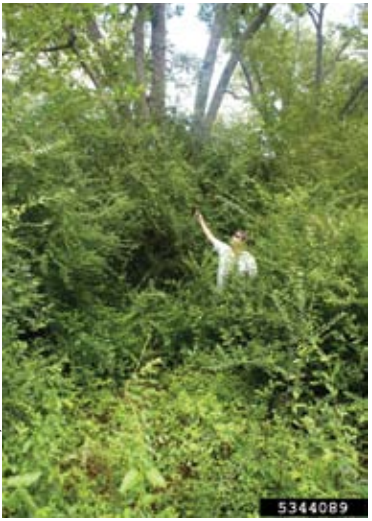
C. Bargeron, UGA

Some non-native plants were used here for many years before they became an invasive problem. This phenomenon has been termed "The Lag Phase". This refers to the period of time after a plant has been introduced, escapes, and naturalizes but before the population reaches the point at which it begins to increase rapidly. It may take decades before a plant becomes an invasive problem. This is one reason it is important to track populations of non-native plants which have escaped and naturalized, even though they may not actually be invasive at this time. Tracking non-native plant populations is especially important for species which have been shown to be an invasive problem in other regions, states or countries.

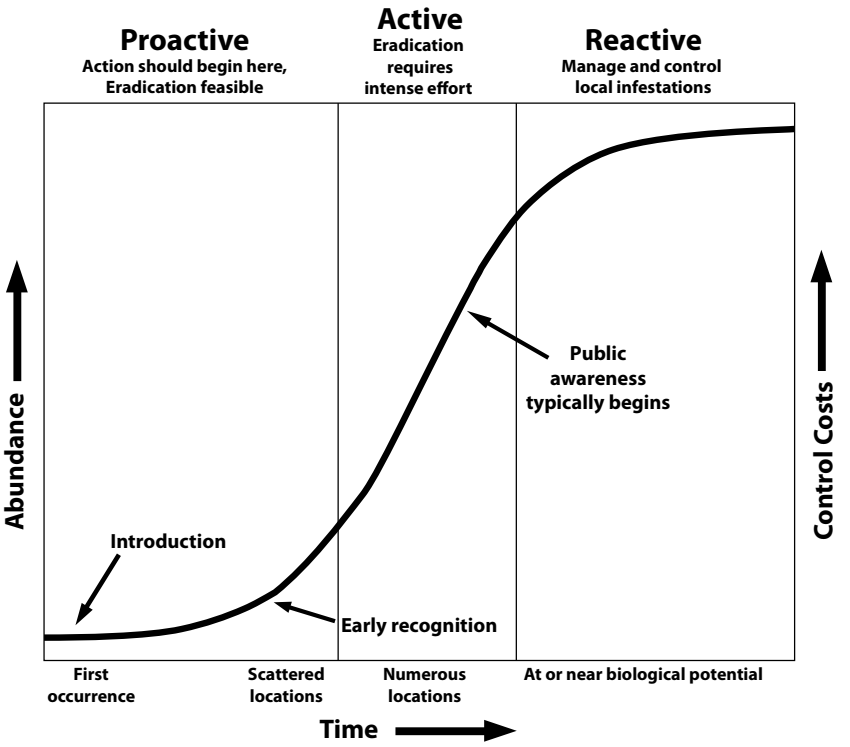


Based on data from the USDA PLANTS database.

The graph shown above represents the lag phase of Chinese privet in the South. Control measures would have been more effective and much less costly had they been started in 1960 as the privet began its rapid spread. Early Detection & Rapid Response programs attempt to identify problem species in the early stages of infestation, so that control measures can be taken before their populations become so large that control is difficult or impossible.



D. Moorhead, UGA



Phases of Invasive Species Invasion and Control

Why Do We Care? The biological pollution caused by invasive species is extremely challenging, because even if we never import another non-native species, the ones already invading our native ecosystems will continue to grow and spread. We must actively seek solutions to control or eradicate the species which are problems already or have the potential to become problems.

C. Bargeron, UGA

Why is it Important to Report an Invasive Plant Sighting?

A key component in an invasive species Early Detection & Rapid Response (EDRR) program is the development of species distribution maps. Entering and tracking locations of invasives within and between states can identify the "leading edge" of invasive plants heading our way. This gives each of us a chance to implement Early Detection & Rapid Response programs in our area. These EDRR programs allow us to stop or minimize an invasive plant before it becomes a "kudzu" kind of problem and allows land managers and agencies to prioritize control needs and strategies while populations are still small.

The Early Detection & Distribution Mapping System, or EDDMapS, is a web-based mapping system for invasive species distribution that is fast and easy to use and doesn't require GIS experience or software.

Using standardized on-line data forms, you can add specific information about the infestation and images to the EDDMapS database. This database aggregates data from other mapping projects and cooperators to display invasive species distribution at county, state and national level scales.

Gathering the information is as simple as taking pictures of the invasive plant and noting the location. Location information can be determined by taking the GPS coordinates on-site, or by using the EDDMapS on-line map functions to locate the point of the infestation.

EDDMapS
Step-By-Step Instructions for Reporting an Invasive Plant Sighting

The basic information required: Who collected the data, Description of invasive species infestation, When and Where you collected the data and Images of the invasive species.

First time only: Register as an EDDMapS user.

1. Go to the EDDMapS website (http://www.eddmaps.org)
2. Select “Report Sightings” from the menu bar.
3. Click the “Register Now” button.
4. Fill out the form with your name, email address, etc.
5. Click the “Submit” button. Your information can be easily changed or updated any time from your personal EDDMapS page.

Once you have registered for EDDMapS, you will simply sign in to report an infestation.

C. Evans, River to River CWMA

S. Dewey, USU

D. Moorhead, UGA

S. Hight, USDA ARS

C. Herms, OSU

C. Bryson, USDA ARS

W. Ciesla, FHMI

Who collected the data

From the EDDMapS website (http://www.eddmaps.org)

1. Select Report Sightings from the menu bar.
2. Log in under, Please Log In. You are now ready to begin the reporting procedure.
3. Select the state for which you are reporting an infestation.

On the reporting form you will see a number of fields.

Note: If you place your cursor over a (?) at the end of each field on the form you will get a definition or more information about filling out that field. You might want to take a few minutes the first time you reach this page to explore the information available at each (?). This information answers the questions most often asked about filling out the form. Most of the fields have drop down menus with a list of possible choices for that field.

L. Mehrhoff, UCONN

Description of invasive species infestation

1. Pest Species: Click on the arrow on the right; you will find a drop-down menu to see the list of invasive species. If the species you have found is not listed, choose Other Species and add the name of the pest in the Comment text box below. If you are not sure what the species is, choose Unknown.

Note: Species are listed in alphabetical order by scientific name, although the common name is also listed. You can click on the Species Information tab and then on Subject Name and the list will then alphabetize by common name.

J. DiTomaso, UC Davis

J. Miller, USFS

2. Infested Area: Area of land containing one invasive species. An infested area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the invasive plants, excluding areas not infested. This can be done visually. Areas containing only occasional invasive plants per acre do not equal one acre infested. It is highly recommended that only a single invasive plant species be entered for each infested area. Choose the unit area from the drop down menu; choices are acres, hectares, square feet, or square meters.

3. Gross Area: This field is intended to show general location and population information. Like Infested Area it is the area of land occupied by an invasive species. Unlike Infested Area, the area is defined by drawing a line around the general perimeter of the infestation not the canopy cover of the plants. The Gross Area may contain significant parcels of land that are not occupied by invasive plants. Again, choose the unit area from the drop-down menu.

Note: The definitions for Infested and Gross Area are taken from the North American Weed Management Association guidelines in "North American Invasive Plant Mapping Standards".

In this example of a field infested with Cogongrass the Gross Area is the whole field. The cogongrass in the example is outlined and would be considered the Infested Area.

F. Price, FNAI

4. Habitat: From the drop down menu, choose the description that best describes the habitat within which the invasive species occurs. If you do not see the appropriate habitat listed, choose Other and add any clarification needed in the Comment text box.

5. Canopy Closure: Canopy closure is a way to estimate the amount or severity of an invasive plant infestation. Area tells you the extent of the population across the landscape. Canopy closure tells how that weed dominates the vegetation within that area. The greater the canopy cover the more of the invasive plants there are.

D. Stephens, Bugwood.org

6. Abundance/Density: Choose the most appropriate answer from the dropdown menu: Single Plant, Scattered Plants, Scattered Dense Patches, Dense Monoculture.

7. Patch Type: A single plant or very small group is a point; an infestation along a fence line, river bank or road is a linear patch; a polygon is a shape with three or more sides, so it covers any other type of patch.

8. Plant Description: Check each description which applies at the time you gather the data.

When you collected the data

1. Observation Date: Enter the date you observed the pest species in the format mm/dd/yyyy.

Where you collected the data

1. County: Choose the county where the invasive species was observed from the drop-down menu.

2. Latitude/Longitude: Enter the Latitude and Longitude coordinates. Remember to put the negative sign in front of the Longitude coordinate to place your entry in the Western hemisphere.

Note: You can find the coordinates using a GPS unit at the site when you collect the data. Make sure you set your GPS unit to NAD83 or WGS84 and to decimal degrees.

Or……

You can select a location using the mapping tools on the form. Select Choose Location from Location Tools. A Google map will appear. Choose the normal map view, a satellite image, or a hybrid of the two. Click on the map in the general area of the infestation and you will see a pinpoint at that spot.

Increase the magnification of the point by clicking the plus (+) sign on the upper left hand corner of the map until you have zeroed in on the site where the infestation was found.

You can adjust the location of the pinpoint by clicking on the appropriate spot on the map. Each time you click, a new pinpoint will appear. When the pinpoint is in the correct spot, click on Update Report Form. You will see the correct latitude and longitude entered for you.

3. Site Name: If desired, a descriptive name can be entered for the site; for example, Stone Mountain Park North Entrance.

4. Ownership: From the drop-down menu, select the ownership type for the property on which the invasive plant was found.

Note: Remember, you need permission from landowners to be on private property.

5. Location Description: Use this text box to add any information that would aid in relocating the infestation or to clarify any other entry.

6. Comments: Add any additional comments related to the infestation.

7. Identified by: Enter the name of the expert identifying the plant if someone else provided the identification.

Images of the Invasive Species

The next section of the online form allows you to upload images with your report. Good images are important and allow an expert to validate your entry by making a positive identification of genus and species.

1. Image: Simply click Browse and navigate to the picture on your computer. Click Open and the image location will be entered for you. You can upload up to five images.

2. Caption: Add a caption to describe each image. Provide as much detail as possible. Include the photographer's name if someone else took the picture.

Note: Image recommendations include leaf shape and arrangement, flowers, fruit, roots, and unique features like thorns. Whole plant images showing the habit of the species are also appropriate when included with close-up images. Use a tripod when needed to reduce the motion of the camera. Take photos with the sun behind you.

Leaf shape and arrangement can be seen in this image.

K. Rawlins, UGA

This is a good example showing the flower and leaf shape in one image

R. Wallace, Bugwood.org

This image helps show the extent of this infestation of *Hedera helix*.

C. Bargeron, UGA

Herbarium Specimen

The next section of the form allows you to provide information when you collect an herbarium specimen of an invasive plant.

1. Voucher Specimen Made: If a voucher specimen was created from this sighting click Yes. The default setting is No.

2. Herbarium holding specimen: Enter the name of the herbarium where the specimen is housed.

Note: See www.gainvasives.org/handbook/Herbaria.pdf for information on how to collect, prepare and submit an herbarium specimen. Herbarium specimens are not required for submitting data to EDDMapS. They add validity to the data submitted.

The last step is to click Report.

The data is now entered into EDDMapS and your images are uploaded. Congratulations! You have successfully completed an entry into EDDMapS.

Be sure to go to your personal EDDMapS page. This is where you can keep track of "Your Stats"; view, revisit or edit the data you have entered; view or edit your profile, as well as set up and manage alerts for invasive species.

The Tools and Training page has an excel worksheet for downloading batch data into EDDMapS. The instruction sheet for the template is located here as well. The Tools and Training page is also where you can download and print the forms for collecting data in the field. It is available as a pdf or word document so that you can edit it as needed for your data collection.

Collecting the data on Invasive Species

GPS

GPS stands for Global Positioning System. It is a satellite-based navigation and positioning system which works night and day, 24 hours a day, anywhere in the world. Vertical and horizontal imaginary lines form a grid which allows us to find a single point anywhere on the earth.

K. Rawlins, UGA

Latitude/Longitude

Latitude is expressed as degrees north or south of the equator (Southern Hemisphere is denoted by a negative). One degree of latitude covers about 69 miles. Latitude lines begin at and are parallel to the equator. The equator is at 0° latitude, the North Pole is at 90° North latitude and the South Pole is at 90° South latitude.

Longitude lines are called meridians and are expressed as degrees east or west of the Prime Meridian which is at 0° longitude (Western Hemisphere is denoted by a negative sign). Longitude lines meet at the poles. One half of the world is measured in degrees of east longitude up to 180°, and the other half in degrees of west longitude up to 180°.

A GPS unit can give latitude and longitude in different formats. Decimal degrees is the format used in EDDMapS. Here is the same coordinate system expressed in different ways:

32° 45’ 12” x -84° 35’ 57” DD/MM/SS (Degrees, minutes, seconds)
32° 45.2000’ x -84° 95.00’ DD/MM.MMM (Degrees, decimal minutes)
32.75333° x -84.59917° DD.DDDDD (Decimal degrees)

Datum
Use NAD83 (North American Datum of 1983) or WGS84 (World Geographic System) which are ground based mapping systems that match coordinates and helps ensure accuracy, since the earth is not a perfectly shaped ellipsoid.

How does GPS work?
GPS measures the time difference between signals sent from a satellite with a known position to a ground receiver. Four such signals will very accurately determine the position of the receiver. Twenty-four satellites, each circling the earth twice every day (with three more extras) constitute the heart of the system.

Setting Up Your Receiver
You will need to set up your receiver to display geographic coordinates in decimal degrees. GPS receiver menus often have this setting in the Units tab. Check the manual of the model you choose for specific instructions. GPS receivers generally now have 12 or more channels, which indicate how many satellites, can be monitored at one time.

P. Bolstad, UMN

Choosing a GPS Receiver
Many different types of GPS devices are available today. A basic handheld unit is all that is needed to collect data for EDDMapS. If you are doing a lot of field work, be sure the unit you choose is waterproof. Smartphone applications with GPS are available as well. GPS units are available from a wide variety of local and online sources. Choose the GPS unit that best fits your particular needs and budget.

R. Anderson, USFS

K. Rawlins, UGA

Digital Imaging

A key component of EDDMapS is providing images in digital format. Being able to use photographs to identify the species adds validity to the data collected and entered into EDDMapS. This module addresses general photography topics, including types of photographs, tips for taking quality photographs, and an introduction to digital photography. Information on uploading images is addressed in the "How To EDDMapS" section.

Identification

Nearly all field guides and identification keys rely on illustrations because seeing a picture or drawing of an organism greatly aids in the correct identification. These pictures may be of the whole organism or simply a specific characteristic or feature important for distinguishing that organism.

With a person to give scale to the picture it becomes clear just how large these plants are

C. Bargeron, UGA

For instance, a picture of an exotic plant infesting a natural area can help demonstrate the invasive potential of that plant. This type of picture can lend credibility to statements made by the photographer or user of the image. Familiarize yourself with the characteristics commonly needed for identification like the glandular notches of tree-of-heaven and take several pictures of the subject's diagnostic characteristics to ensure that identification is possible. Good photographs can also add validity to documentation of certain events, such as the first occurrence of a species in a county. Herbarium records have the highest validity, so consider collecting an herbarium specimen for the first reported occurrence of an invasive species in a region or county.

The following section briefly explains basic techniques and gives tips for taking useful photographs. To fully understand your camera's options, refer to the user manual.

C. Evans, River to River CWMA

Glandular notches on tree-of-heaven leaflet.

Framing
Frame the subject for the intended purpose. Panoramic photographs give context to the subject, for example showing the extent of an infestation. Midrange shots illustrate the presence and effects of specific species and close-ups provide details for identification of a species of interest.

Focus
Attention is naturally drawn to the area of the photograph that is in focus. For landscape scale photographs, most of the scene should be in focus. For subjects closer in, the photographer should be sure the most important part of the photograph is in focus. For plants you can focus on the entire plant or simply the area of interest. Many digital cameras do this automatically for you.

Light
The type, direction and intensity of the light can affect the color and texture of an image. Hard light on a sunny day or from a direct flash emphasizes shadows, highlights, and textures. Soft light in early morning, late evening or cloudy days minimizes shadows and highlights and brings out color and detail. The direction of a light source will also influence the photograph. Front light (the light source is in front of the subject) highlights colors while eliminating shadows and textures. Backlight creates silhouettes or illuminates translucent subjects. Sidelight highlights both texture and color of a subject.

Front light

Back light

Note: Example images are of a native species, *Monotropa uniflora,* Indianpipe.

Background
Backgrounds which contrast to the main colors of the subject help make the subject stand out in the photograph, while backgrounds similar to the main colors of the subject make the subject blend in more. A busy background can be distracting and make viewing the subject difficult. Try changing the background by changing the angle of the camera or by placing something behind the subject. It can be as simple as a white or black sheet of paper behind a leaf to help it stand out more clearly.

Digital Cameras

Digital cameras are recommended for collecting data for EDDMapS. Because of the large storage capacity of digital cameras, you can take several pictures of each subject and simply choose the best images to upload with your data. Digital cameras also allow you to easily upload images from your computer directly to EDDMapS.

There are two basic types of digital cameras: point & shoot and single-lens reflex (SLR). Point & shoot digital cameras are essentially automatic, with limited ability to adjust settings. The advantages of point & shoot cameras are their lower cost (compared to SLR cameras), small size, and light weight. SLR digital cameras are more expensive and larger, but offer the photographer a suite of automatic settings in addition to the manual setting and through-lens focusing and framing. With SLR cameras, interchangeable lenses enhance zoom and macro features. Zoom lenses allow the photographer to take "close-up" photographs at a greater distance from the subject. This is advantageous when the subject is an animal that might become scared or leave if approached. Lenses with adjustable zooms also allow for easy manipulation of the framing of a photograph. Wide-angle lenses provide a wide field of view and can be very useful for landscape photography. Macro lenses allow for close up photography and can be used to capture small subjects or minute details necessary for identification. Images should be taken at the largest size and best quality settings available on your camera. Send the least edited, least compressed file available.

Note: Most modern cell phones feature a camera with sufficient resolution for submission to EDDMapS.

Flowers and leaves

K. Rawlins, UGA

Roots

L. Mehrhoff, UCONN

JPEG uses a compression scheme that degrades the image each time it is saved: consequently, it is important to avoid repeatedly editing and saving the file before submission. If editing, cropping, or enhancing the JPEG photo using image editing software (such as Adobe Photoshop) is necessary, perform all operations in one editing session and save the edited image at the highest quality (least compressed) possible. Retain a copy of the original file from the digital camera in case the editing process has to be repeated.

Note: EDDMapS requires images to be uploaded as JPEGs.

The EDDMapS web form allows as many as five images to be uploaded with each record entered. Examples of possible subjects for plants include the following:

- Site view showing extent of infestation, one invasive plant or many
- Flower shape, size, color and arrangement
- Leaf shape and arrangement (opposite, alternate or whorled attachment)
- Fruit shape, size, color and arrangement
- Bark, trunk or stem
- Roots, rhizomes or stolons

Forestiera pubescens

K. Rawlins, UGA

Ligustrum sinense

K. Rawlins, UGA

As you can see there are more than five possible characteristics to choose from, so pick the five which are most helpful in identifying the plant you are working with. Invasive privets (*Ligustrum* spp.) have many characteristics in common with native swamp privet (*Forestiera* spp.); however, the position of the flower or fruit can help easily distinguish between them.

Remember:

- To reduce shake, use a tripod when possible
- Take multiple photographs of the same subject and choose the best for uploading with your data
- Look for the unique features of an invasive species, such as pointed rhizomes on cogongrass or glandular notches at the base of tree-of-heaven leaflets.
- Position yourself so the sun is over your shoulder to get the best light (Front lit image) for sharper details
- Automatic settings on digital cameras work very well for most situations
- Digital cameras usually have a macro setting for close-ups

Remember the images you submit will be used to validate your report to EDDMapS. Good images can make all the difference in your entry being given the highest validation.

R. Wallace, Bugwood.org

C. Evans, River to River CWMA

J. Miller, USFS

J. Randall, TNC

Field Preparation

Group Projects

During training and for several outings after the initial training, we suggest that projects be carried out in groups with designated leaders supervising data collection. For small group outings, you will need at least one field kit (GPS unit, digital camera, and other resources). Only one GPS and camera is needed per group outing. One person from each group should be in charge of entering the data into the web-based data form after returning from the field. The data record should include the names of all participants of the group.

R. Billings, TFS

Individual Projects

Volunteers may choose after training to work individually either at assigned sites or on personal hiking/camping/birding outings. Volunteers choosing this method should still have a companion with them in the field for safety.

Local Networks

Stakeholders can form a network of local partners for invasive species prevention, monitoring, control, and eradication. Monitoring sites may be chosen based on recommendations and requests from these partners. In some cases, an organization may request help with early detection in previously unmonitored areas or in areas which have already been treated to determine eradication success. The goal should be to prioritize target areas that are most in need of monitoring. It is important to be aware of the rules regarding public vs. private property and various agency requirements for data collection.

R. Westbrooks, USGS

Public and Private Land Issues

The goal of the EDDMapS is to have many eyes detecting and reporting invaders in as many different places as possible. However, we have to be mindful of both public land rules and regulations and the rights of private landowners.

Public Land – Some agencies have very strict rules concerning collection of data and specimens on public property. For example, the National Park Service requires researchers to obtain permits for these kinds of activities. When in doubt about the public ownership of a property you plan to survey or the rules of collecting data on public lands, contact the agency responsible for the management of that property. We think you will find that most, if not all, public land managers will be supportive of efforts to detect invasive species on publicly held lands.

Private Land – It is important that we respect the rights of private landowners and only collect data on their land with their specific permission. Keep in mind that public rights-of-way like roads are not considered private land. Many of your surveys will be along rights-of-way.

R. Wallace, Bugwood.org

Field Safety

Due to the field-oriented nature of the data collection, your work will present you with the inherent physical risks posed by walking in a natural environment while getting to field sites and collecting data. We recommend you follow these suggested safety precautions:

- Avoid walking through areas where you cannot see your feet. Thick vegetation may hide venomous animals or uneven terrain from view. Always be aware of your surroundings.
- If searching for invasive species patches from a vehicle, always go in teams. Vehicle drivers should pay attention to the road. Passengers can look for target species.
- When surveying on roadsides, pull vehicles well off the road, taking care to park on a firm surface. Be aware of passing traffic and stay clear of traffic lanes while collecting data.
- Bring a cell phone (but be aware that many remote areas are out of service range), and carry a topographic map or trails map of the area in which you are hiking.
- Always hike with at least one partner and inform someone at home, a neighbor or friend of where you are going and when you plan to return.
- Bring sufficient water and sun protection.
- Wear appropriate clothing and footwear
- If you have known allergies or other medical conditions that might require you to take medications in the field, then bring your medications with you.
- Check the weather before you head to the field site. It is dangerous to work in adverse weather conditions such as thunder and lightning storms or storms which may produce flash floods.

A well-equipped field kit should include the following:

- Backpack
- Camera memory card
- GPS Unit
- Blank data sheets
- Seed removal brush
- First Aid kit
- Species ID cards
- Camera
- Extra batteries
- Clipboard
- Maps
- EDDMapS handbook
- Pencils/sharpie pens

Developing Invasive Species Programs:

1. Establish a state EDRR coordinating committee
   a. Develop a committee work plan
   b. Identify committee members; develop an EDRR target list
   c. Develop a clear communications structure with protocols for reporting, id and vouchering, data archival, rapid assessments, and rapid response initiatives

2. Develop and train a state Early Detection and Reporting Network (EDRN)
   a. Agency field personnel (Department of Natural Resource biologists, Nature Conservancy land stewards, county extension agents, county weed supervisors, Department of Ag inspectors, etc.)
   b. EDRN volunteers (Native Plant Society members, friends, groups, civic club members, master gardeners, fishermen, scouts, 4-H, FFA, etc.)

3. Identify, survey, and monitor important natural and managed resources that are at risk from biological invasion.
   a. Conduct weekend bio-blitzes for new weeds at selected parks, forests, refuges, etc.
   b. Monitor high hazard sites where new invasive species may first become established (e.g., maritime ports of entry, international airports, bonded warehouses, free trade zones, inland intermodal shipping terminals)

4. Develop a state Invasive Plant Atlas
   a. Archival of field data records submitted by the EDRN
   b. "Real-time" Distribution Information on EDRR Target Species – Beneficial for:
      i. Creating Distribution Maps of EDRR Target Species
      ii. Ecological Niche Modeling Research
      iii. Planning Invasive Plant Control Programs

N. Rees, USDA ARS

J. Miller, USFS

5. Rapid Assessment – conduct rapid assessments of newly reported species that are not already regulated within a state (regulated species generally don't require a new assessment).
   a. Identify an appropriate lead agency to address a particular new invasive plant problem
      OR –
   b. Recommend the establishment of an invasive plant task force to address a new invasive plant problem that cannot be addressed by a single agency.

6. Rapid Response – develop a rapid response plan to address specific problems.
   a. Assist the designated lead agency in addressing a new invasive plant problem
      OR –
   b. Establish an invasive plant task force to address the problem – as appropriate. The Carolinas Beach Vitex is a good example of a successful interagency partnership.

7. Take the message to others, especially young people. Volunteer to talk about invasive species and what each of us can do to help at a local school or scout group.

N. Loewenstein, AU

J. Miller, USFS

J. Randall, TNC

K. Rawlins, UGA

Glossary

Canopy Closure: Estimate of what percent of the ground is covered by the foliage of an invasive species of interest.

Collection Date: The date the weed infestation was observed in the field. It does not refer to the date information was entered into the computer.

Datum: A model of the earth's shape. Geodetic datums define the size and shape of the earth and the origin and orientation of the coordinate system used to map the earth.

EDRR: Early Detection & Rapid Response refers to programs whose goal is to locate and manage invasive pests before they infest an area so large that eradication or control becomes extremely difficult and expensive, if not impossible. Addressing these problems early greatly decreases the damage caused by these infestations.

GIS (Geographic Information System): A computerized system for the collection, storage, management, retrieval, changing, modeling, analysis and display of spatial data used to create a representation of the real world.

GPS (Global Positioning System): A global navigation system based on a system of high orbiting satellites. The GPS receiver uses at least 4 satellites to compute position.

Gross Area: This field is intended to show general location and population information. Like Infested Area it is the area of land occupied by an invasive plant species. Unlike Infested Area, the area is defined by drawing a line around the general perimeter of the infestation not the canopy cover of the plants. The gross area may contain significant parcels of land that are not occupied by invasive plants. Gross area is used in describing large infestations. When a value is entered for gross area, the assumption is that the area within the perimeter of the invasive plants population (area perimeter) is an estimate or the product of calculating the area within a described perimeter. It is not a measured value. If a value for Gross Area is entered a value for Infested Area must still be entered. The value for Infested Area is derived from estimating the actual or percentage of land occupied by invasive plants.

Infested Areas: Area of land containing one or more invasive plant species. An infested area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the plants, excluding areas not infested. Areas containing only occasional invasive plants per acre do not equal one acre infested. Generally, the smallest area of infestation mapped will be 1/10th (.10) of an acre or 0.04 hectares.

Latitude: The angular distance (distance measured in degrees) north or south of the equator. Latitude is 0 degrees at the equator, 90 degrees at the north pole and -90 degrees at the south pole.

Longitude: The angular distance (distance measured in degrees) east or west of the prime meridian. Longitude is 00 at the prime meridian, and is measured +180 going east and -180 going west.

Map: A general representation of the real world.

Meridian: A meridian is one half of a great circle on the globe connecting all points of equal longitude; all meridians connect at the North and South poles. The Prime meridian is the reference meridian for latitude and longitude.

Prime Meridian: A great circle passing through the north and south pole and through Greenwich, England. Its longitude is 0 degrees.

Topographic Map: A map that displays both the horizontal and vertical positions of the features represented. It uses contours or other symbols to represent mountains, valleys, and plains.

This EDDMapS data collection form contains all the information needed to fill out the online form. Find forms to download and print at www.eddmaps.org/tools/.

EDDMapS
Early Detection & Distribution Mapping System
www.eddmaps.org

Data Collection Form

Species_____ **Date**_____

State_____ **County**_____ **Lat.**_____ **Long.**_____

Infested Area_____ Acres Hectares Sq. Feet Sq. Meters

Gross Area_____ Acres Hectares Sq. Feet Sq. Meters

Canopy Closure (percent covered by invasive plant):

Trace (less than 1%) Low (1.0 - 5.0%) Moderate (5.1 - 25%) High (25.1 - 100%)

Habitat:

☐ Edge: Upland / Wetland	☐ Forest: Conifer	☐ Wetland: Marsh
☐ Edge: Field / forest	☐ Forest: Hardwood	☐ Wetland: Swamp
☐ Edge: Lake	☐ Forest: Mixed	☐ Wetland: Bog
☐ Edge: Roadside	☐ Dune	☐ Streambank
☐ Open Field	☐ Beach	☐ Yard / Garden
☐ Old Field	☐ Park	☐ Ag. Field
☐ Right-of-way	☐ Rocky Outcrops	☐ Abandoned lot / homesite
☐ Other		

Abundance:

☐ Single Plant ☐ Scattered Plants ☐ Dense Monoculture ☐ Scattered Dense Patches

Ownership:

☐ Federal Lands ☐ State Lands ☐ Private ☐ Unknown

Location Description:

Comments:

Voucher specimen made? ☐ Yes ☐ No **Herbarium holding specimen**_____

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